Coal: A Fossil but No Dinosaur

by Tony Rosenberger

COAL, ONE OF THE MOST ABUNDANT RESOURCES in the United States, is a combustible mineral that has both a long, rich history and a bright, promising future. While it dates back to the time of the dinosaurs, coal shows every indication of being the energy source of choice for the next century as well.

Coal, like petroleum and natural gas, is a "fossil fuel" — energy that can trace its beginnings to once-living organic materials. It developed from the remains of ferns, trees and other plants that died in tropical forests as early as one million years ago and as far back as 400 million years ago. Many of these plants were buried under prehistoric forests until geological processes compressed and altered the remains, increasing the amount of carbon present. The end result is what we know today as coal.

Coal's chemical makeup is a very complex structure, including sulfur, carbon, oxygen, hydrogen and nitrogen, as well as small quantities of aluminum, zirconium and many other minerals.

Because of the various results that geological forces had on altering the plant remains to make coal, there are four types of this resource. *Bituminous*, or "soft" coal, is the most commonly used coal for generating electricity in the United States and many parts of the world. *Lignite* is a brownish-black coal with ash and high moisture content giving it a low heating value. Nevertheless, it serves as an important energy source for electricity generation in the Southwestern region of this country.

There is also *subbituminous* coal — which has a dull black color and a higher heating value than lignite — and *anthracite*, also known as "hard" coal. Anthracite has the highest energy content of all the coals.

Coal is located in 38 states, and it underlies 458,600 square miles, or about 13 percent, of the nation's land area. The nation's primary source of coal is found in the West in the Wyodak coalbed, part of the Powder River Basin of Wyoming and Montana. The most important deposits in the East are located in the Appalachian Region.

U.S. coal production has been on the increase for the last couple of decades. In 1997, the Eastern region produced about 579.4 million short tons of coal, which was up from 563.7 million short tons in 1996. The West saw an increase in production from 500.2 million short tons in 1996 to 510.6 million in 1997. Surface mining saw an increase from 654 million short tons in 1996 to 669.3 million short tons in 1997. Overall, total production increased from 1,063.9 million short tons in 1996 to 1,089.9 million short tons in 1997.

The top three coal producers in the eastern part of the United States for 1997 included: West Virginia, which produced 173,743 thousand short tons; Kentucky, with 155,853 thousand short tons; and Pennsylvania, with 76,198 thousand short tons. In the West, Wyoming led the pack with 281,881 thousand short tons, while Texas and Montana followed with 53,328 and 41,005 thousand short tons, respectively.

Coal is the primary source of energy produced in the United States. It currently accounts for 55.2 percent of electricity generated by public utilities, and coal use by the utilities has increased by about 173 percent over the past 20 years.

Coal also is exported to more than 40 nations around the world, primarily Canada, Japan and Italy. Total exports were close to 83.5 million short tons for 1997.

Coal has many uses in industries and manufacturing plants, especially those that make chemicals, cement, paper, ceramics and various metal products. Coal by-products are part of many daily items used by Americans such as insulation, linoleum, medication, detergent, perfume, food preservatives and flavoring, fertilizer, solvents and wood preservatives.

Coal also is an important fuel for heating and powering foundries, cement plants and other industrial and manufacturing facilities. It is used as a source of heat in commercial establishments as well as homes. In fact, the high efficiency and low cost of coal as an energy source make it the most appealing fuel for electricity generation. The Department of Energy reports that coal averages $1.39 per million Btu as a power fuel, while petroleum averages $2.37 and natural gas averages $2.56.

While coal was once regarded as a "dirty" fuel, practices developed over the past two decades have changed that. Wider use of low-sulfur coal, the technique of "scrubbing" (which removes sulfur and particulate matter before the coal is burned) and clean coal technologies have combined to ensure that the air is getting cleaner even as coal use by electricity has increased by leaps and bounds. In 1976, utilities burned 448 million tons of coal to generate 944 billion kilowatt-hours of electricity; emissions of sulfur dioxide (SO_2) from coal-fired plants were 17.6 million tons. In 1995, the most current year available, utilities used 829 million tons of coal to generate 1,653 billion kilowatt-hours of electricity — but SO_2 emissions declined to 11.6 million tons.

As technological advances and economic development throughout the world spur the need for more energy, the United States should have a strong outlook for future exports. With an estimated 494 billion tons of demonstrated coal reserves in the United States, and with the present rates of recovery and use, this "old" fossil fuel is ready to last for the next 250 years and perhaps even longer. ◆

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